

- 10 -

C L A I M S

1. A method for selectively reducing the permeability of one or more relatively permeable geological layers of an oil-bearing formation, to inhibit breakthrough of driving fluid from a driving fluid injection well via at least one of said layers into an oil production well, which method comprises the steps of:

- injecting a driving fluid comprising a first compound into the formation via the injection well;

- detecting the first compound in well fluid of the oil production well;

- upon detection, injecting a second compound into the formation via the oil production well, to react with the first compound in order to provide a flow restriction generated by a third compound which comprises a reaction product of the first and second compounds in at least one relatively permeable geological layer through which breakthrough of the driving fluid into the oil production well has occurred.

2. The method according to claim 1, wherein a second fluid comprising the second compound is injected via the production well, which second fluid has a mobility intermediate between the mobilities of the oil and of the driving fluid in the formation.

3. The method according to claim 1 or 2, wherein the first compound is inert relative to the compounds present in the oil-bearing formation.

4. The method according to any one of claims 1-3, wherein the first compound comprises an alkaline material and the second compound comprises iron chloride.

5. The method according claim 4, wherein the second compound further comprises hydrochloric acid, corrosion

- 11 -

inhibitor, and/or flocculent, such as a low molecular weight poly acryl amide (PAA) or partially hydrolyzed poly acryl amide (PHPAA).

5 6. The method according to any of the preceding claims, wherein the first compound is encapsulated.

7. The method of any preceding claim, wherein the oil-bearing formation comprises various oil-bearing layers having different permeabilities, which layers are separated by substantially impermeable layers, such as shale barriers, and wherein the method is applied to inhibit breakthrough of driving fluid into the production well via one or more relatively permeable oil-bearing layers.

10 8. A kit of compounds for use in a method according to any one of the preceding claims, comprising a first compound for injection into a subsurface formation via an injection well which first compound can pass through the formation concurrently with a driving fluid, and a second compound for injection into the formation via a production well, which second compound can react with the first compound so as to form a reaction product in the formation which imposes a flow restriction.

15 9. The kit according to claim 8, wherein the first compound comprises an alkaline material and the second compound comprises iron chloride.

20 10. The kit according to claim 9, wherein the second compound further comprises hydrochloric acid, corrosion inhibitor, and/or flocculent, such as a low molecular weight poly acryl amide or partially hydrolyzed poly acryl amide

25 30 11. The kit according to any of the claims 8-10, wherein the first compound is encapsulated.